One-Sided 3D Imaging of Non-Uniformities in Non-Metallic Space Flight Materials, Phase II

Completed Technology Project (2011 - 2013)

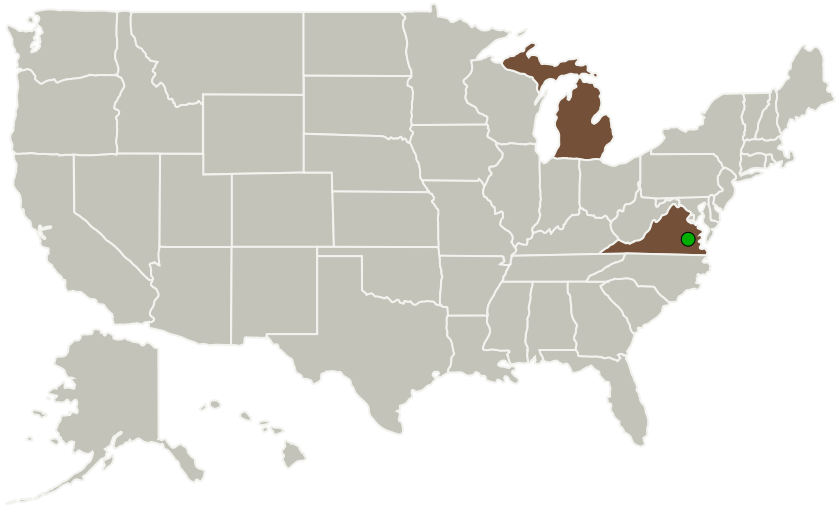
Project Introduction

In this Phase II project, we propose to develop, construct, and deliver to NASA a prototype single-sided computed tomography time-domain terahertz (single-sided CT TD-THz) scanner accessory. This accessory will be suitable to be mounted onto a non-destructive evaluation (NDE) imaging gantry for the single-sided inspection of spacecraft and launch vehicle composite structures. The single-sided CT TD-THz scanner will be an accessory which works with existing T-Ray 4000

REG

TD-THz NDE imaging instruments owned by NASA (and other aerospace firms). We will also develop, and deliver a software package which employs the model-based image reconstruction (MBIR) methods. The MBIR method allows the reconstruction of 2D slices in depth from the data acquired by the single-sided CT TD-THz scanner. These 2D slices can then be stacked laterally to generate 3D images of sub-surface structures, features and defects. Time-domain terahertz imaging in the 0.1 to 3 THz spectral range is currently being used to characterize defects in Space Shuttle insulation and related materials. The proposed project will largely be configured from standard Picometrix THz sub-components, but incorporate measurements of the scattered THz fields, enabling full 3D reflection-mode reconstruction of non-metallic materials where only one side is accessible.

Primary U.S. Work Locations and Key Partners



One-Sided 3D Imaging of Non-Uniformities in Non-Metallic Space Flight Materials, Phase II

Table of Contents

One-Sided 3D Imaging of Non-Uniformities in Non-Metallic Space Flight Materials, Phase II

Completed Technology Project (2011 - 2013)

Organizations Performing Work	Role	Type	Location
Picometrix, LLC	Lead Organization	Industry	Ann Arbor, Michigan
Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations	
Michigan	Virginia

Project Transitions

September 2011: Project Start

September 2013: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/139312)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Picometrix, LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

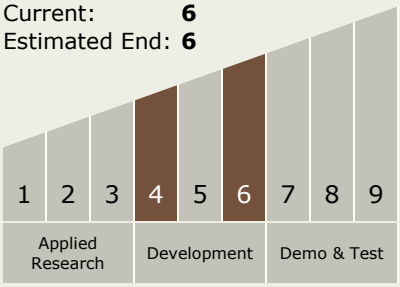
Carlos Torrez

Principal Investigator:

David Zimdars

Technology Maturity (TRL)

Start: **4**
Current: **6**
Estimated End: **6**



One-Sided 3D Imaging of Non-Uniformities in Non-Metallic Space Flight Materials, Phase II

Completed Technology Project (2011 - 2013)

Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - TX12.4 Manufacturing
    - TX12.4.5 Nondestructive Evaluation and Sensors

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System